NOTES FOR STUDENTS.

APOGAMY in the genus Alchemilla has been investigated very thoroughly by STRASBURGER.[7] The work was suggested by MURBECK'S researches; and his statements that the embryo of the EUALCHEMILLAE develops from the egg without fertilization, and that there is no reduction of chromosomes in the life history, are confirmed. On the other hand, STRASBURGER reaches a different conclusion as to the origin of the embryo sac of apogamous species of Alchemilla, and has a different theory as to the nature of the embryogeny of these species.

More than forty species were studied. In the European species the pollen, except in a few species, is abnormal, the development being checked at various stages. The pollen mother-cells may disorganize or a tetrad may be formed, but the pollen grains fail to be liberated from the mother-cell. In some cases, the division into tube nucleus and generative nucleus takes place, but such pollen grains disorganize early. There are thirty-two bivalent chromosomes in the pollen mother-cells, and sixty-four univalent chromosomes in the vegetative tissues. In American and African species, an examination of herbarium material showed normal pollen, and it is probable that fertilization occurs in the usual way.

In the ovules of apogamous EUALCHEMILLAE one or more megaspore mother-cells appear. The nucleus passes through the prophases of the heterotypic division up to the synapsis stage, but here the mode of development changes and the nucleus divides by a typical vegetative division. Division in the embryo sac shows the sporophytic number of chromosomes, so that when the egg is formed it contains the vegetative number of chromosomes. When such an egg develops an embryo without fertilization, STRASBURGER regards the phenomenon not as parthenogenesis but as apogamy. Strictly speaking, it would not be even a case of apogamy, but we should have merely an adventitious embryo like one coming from cells of the nucellus. There is not the beginning of a new generation.

The subniveal EUALCHEMILLAE which form normal pollen show a reduction of chromosomes in the formation of the megaspores, and fertilization takes place in the usual way. Those EUALCHEMILLAE which have not lost their sexuality are chalazogams, and some of them form hybrids.

It seems probable that the extraordinary mutation of the EUALCHEMILLAE has weakened the sexuality, and that the failure of fertilization has brought on the apogamous condition.

Rubus and Rosa, which were also examined, have retained their sexuality in spite of extensive polymorphism. The reduction division and fertilization occur regularly.

Dioecism has in many cases given an impulse toward apogamous reproduction, since the separation of male and female individuals decreases the frequency of fertilization.—C. J. CHAMBERLAIN.

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[7] STRASBURGER, E., Die Apogamie der Eualchemillen und allgemeine Geschichtspunkte, die sich aus ihr ergeben. Jahrb. Wiss. Bot. **41**:88–164. *pls. 1–4.* 1905.

ITEMS OF TAXONOMIC INTEREST are as follows: S. LEM. MOORE (Jour. Botany **43**:137–150. *pl. 471*. 1905), in describing numerous new Australasian species, has described a new genus (*Cratystylis*) of Compositae (Inuloideae), with 3 species, and one (*Nepenthandra*) of Euphorbiaceae (Crotoneae).—H. CHRIST (Bull. Soc. Bot. France IV. **5**:1–69. 1905) has published an account of the Chinese ferns in the collections of the Museum of Natural History, Paris, describing 41 new species and a new genus (*Neocheiropteris*), to replace Cheiropteris, preempted by a genus of fossil plants.—M. A. HOWE (Bull. Torr. Bot. Club **32**:241–252. *pls. 11–15*. 1905) has described new species of Chlorophyceae from Florida and the Bahamas in Halimeda and Siphonocladus, and has established a new genus (*Petrosiphon*) related to the latter.—H. D. HOUSE (*idem* 253–260. *pls. 16–18*), in presenting Viola in New Jersey, recognizes 33 species and describes one as new.—MRS. E. G. BRITTON (*idem* 261–268) has proposed *Pseudocryphaea* and *Dendroalsia* as new genera of mosses, and has described new species in Erpodium.—A. ENGLER (Bot. Jahrb. **36**:213–252. 1905) has described the following new African genera: *Spondianthus* and *Nothospondias* (Anacardiaceae), *Magnistipula* (Rosaceae), *Pretreothamnus* (Pedaliaceae), and *Cycniopsis* (Scrophulariaceae).—M. L. FERNALD (Rhodora **7**:81–92. 1905) has begun the publication of a revision of the North American species of Eriophorum.—J. CARDOT (Rev. Bryol. **32**:45–47. 1905) has published two new genera of acrocarpous antarctic mosses, naming them *Pseudodistichium* and *Skottsbergia*, the peristome of the latter being described as most extraordinary.—A. A. EATON (Fern Bulletin **13**:51–53. 1905) has described a new species and variety of Isoetes from Washington.—J. W. BLANKINSHIP (Montana Agric. Coll. Sci. Studies **1**:35–109. *pls. 1–6*. 1905), in his "Supplement to the flora of Montana," has published new species in Sagittaria, Zygadenus, Salix, Arabis, Physaria, Sedum, Ribes, Saxifraga, Astragalus (2), Lupinus (4), Impatiens, Ammania, Bupleurum, Carum, and Petasites.—JESSIE MILLIKEN (Univ. Calif. Pub. Botany **2**:1–71. *pls. 1–11*. 1904), in a well-illustrated revision of Californian Polemoniaceae, recognizes 6 species of Polemonium, 5 of Collomia, 22 of Navarretia, 36 of Gilia, 31 of Linanthus, and 9 of Phlox, and describes new species in Gilia and Linanthus.—J. M. C.

PEIRCE[8] has studied the dissemination and germination of the seeds of *Arceuthobium occidentale* on the Monterey pine (*Pinus radiata*) of California. The structure and mechanics of the exploding fruit are described in detail; and the seeds were observed in the laboratory to be thrown fifteen feet, sticking to whatever they struck. The so-called seeds, by the way, are seeds enclosed in the inner part of the ovary. The field observations indicate that the majority of seeds strike the leaves of the pine, either of the tree on which they grow or of one near by. In germination the root is negatively phototropic and not very sensitive to contact. When growth is blocked by some obstacle the root forms a thick foot-like holdfast, into which the material in the upper end of the embryo

[8] PEIRCE, GEORGE J., The dissemination and germination of *Arceuthobium occidentale* Eng. Ann. Botany **19**:99–113. *pls. 3–4*. 1905.

is transferred, the seedling becoming mainly a foot. Vascular elements form in the foot, and its central part grows out into the bark. Strands of infecting cells grow toward the medullary rays of the host, through these to the cambium, and finally effect an attachment with the young xylem elements. While the parasite is thus establishing a connection with the young wood, the main part of the haustorium forms a mass of parasitic cells in the cortex of the host. From this cortical mass buds arise and develop into branches that grow out through the bark into the air. The author remarks that "we have here an instance of regeneration without wounding, amputation, or other pathological stimulus. The small part of the seedling which penetrates the host forms and develops stem and leaves; a small part of one organ—the root—develops into a complete plant by forming the missing members."—J. M. C.

STEINBRINCK [9] finds that MEZ made a very imperfect study of the absorption hairs of Tillandsia, and that his erroneous conclusion could have been avoided easily by reference to published investigations of the author. According to MEZ the four central and empty cells of the hair are free from air and collapsed when dry; but when the thickened portion of the shield absorbs water the appressed walls are forced apart, leaving lumina into which water passes because of negative pressure. The author finds that negative pressure is not a factor at all, and bases this conclusion upon a study of the mechanics of cohesion involved in the shrinkage of artificial cells to which he finds natural cells are comparable. The author first demonstrates that water exercises a cohesive power, which being so well known is perhaps unnecessary. Next he shows that the shrinkage and collapse of artificial cells occurs in a vacuum as well as under ordinary pressure; also that the tension present in a membrane through which water is passing to supply evaporation is independent of air pressure. In the latter case water placed on the surface of such a transpiring membrane is quickly drawn inside because the cohesion pull of the water already inside extends through the fine pores of the membrane. Of course the greater the elasticity of the membrane the stronger cohesion pull it will support and the greater its capacity for bringing outside water within the cell. It is in this relation that the thickened *Deckel* of the scale plays a rôle and not as MEZ found.—RAYMOND H. POND.

KRASNOSSELSKY [10] has made a study of the influence of injury on the activity of the respiratory enzyme in the onion. In agreement with numerous other investigators he finds that injury does increase the respiratory activity of vegetable tissues, and points out that STOKLASA'S failure to confirm this observation was due to his not allowing his experiments to run for a sufficient length of time, and that his belief that the results of other workers were due to bacterial con-

[9] STEINBRINCK, C., Einführende Versuche zur Cohäsionsmechanik von Pflanzenzellen nebst Bemerkungen über den Saugmechanismus der wasserabsorbierenden Haare von Bromeliaceen. Flora **94**:464–477. 1905.

[10] KRASNOSSELSKY, T., Bildung der Amungsenzyme in verletzten Pflanzen. Ber. Deutsch. Bot. Gesells. **23**:142–155. 1905.

tamination is unfounded. Respiration increases gradually after injury, and it is only after several days that the maximum activity is reached. From that time the process goes on more slowly and finally returns to the normal. By grinding the onions with sand and expressing the juice with a Buchner press, he obtains solutions which liberate carbon dioxide, apparently through the agency of an enzyme. After injury this respiratory enzyme shows an increase in its activity, an increase which reaches a maximum somewhat later than the maximum respiration of the tissues from which the extracts are obtained. Onions whose cells are killed by freezing yield more active enzyme solutions than those not previously frozen. These expressed juices give the oxidase reaction with guaiacum, the juices from injured tissues more vigorously than those from uninjured ones.—ARTHUR L. DEAN.

VINES[11] has given the results of a number of experiments carried out for the purpose of throwing light on the nature of the tryptic enzymes of plants. He assumes that if the powers of a plant extract to convert native proteid into proteases and peptones on the one hand, and to reduce protones to the final cleavage products on the other, do not vary concomitantly under the influence of outside influences, then the two processes are carried out by separate enzymes. Experiments were conducted with the enzymes of *Carica Papaya*, *Ananas sativus*, *Saccharomyces Cerevisiae*, *Agaricus campestris*, *Hordeum sativum*, *Hyacinthus orientalis*, and *Nepenthes*. The proteids used were blood fibrin as a native proteid, and Witte peptone as a proteose and peptone mixture. The factors used to produce variation in proteolytic activity were changes in reaction. In every case it was found that solution of fibrin and cleavage of Witte peptone were affected differently by changes in reaction. VINES concludes that the two processes are carried out by different enzymes; the first stage by enzymes of the pepsin type; the second by those of the erepsin group. He is of the opinion, therefore, that pepsin-like enzymes do occur in plants and that the tryptic action is due to the combined action of such enzymes and those of the erepsin group.—ARTHUR L. DEAN.

MASSART'S[12] interesting experiments with geophilous plants should have been noted long since. In the case of the subterranean stock he sees a conflict between the depth of its burial and the development of aerial shoots. In each plant, therefore, there is a most favorable depth of the subterranean stock which is secured and maintained. Experiments were performed involving about two hundred species of plants, well distributed throughout monocotyledons and dicotyledons. Each species was treated in three lots: one lot very near the surface; another 10^{cm} deep; the third 20 to 30^{cm} deep. The results are outlined very briefly under two heads: methods of ascending when planted below the normal depth; and methods of descending when above the normal depth. The

[11] VINES, S. H., The proteases of plants. III. Ann. Botany **19**: 171–188. 1905.

[12] MASSART, JEAN, Comment les plantes vivaces maintiennent leur niveau souterrain. Bull. Soc. Roy. Bot. Belgique **41**[2]: 67–79. *figs. 12.* 1903.

methods of ascending from too great a depth are stated in outline as (1) elongation of internodes, (2) elongation of internodes and position of buds; (3) localization of buds, (4) curving of the rootstock, and (5) curving of the winter shoots. The methods of descending to a greater depth are (1) localization of the buds, (2) curvature of the rootstock, (3) curvature of the winter shoots, and (4) contraction of the roots.—J. M. C.

JOHNSON[13] has published a preliminary note in reference to his study of the Piperales. In addition to Peperomia, Piper, Heckeria, and Saururus, previously studied, he has studied recently Anemiopsis and Houttuynia (Saururaceae), and also representative genera of Chloranthaceae and Lacistemaceae. The general result is a confirmation of the view that the development of the megasporangium and female gametophyte of angiosperms is not a satisfactory index of genetic relationship, for it may vary widely within a single family or genus. In the genera of Piperales studied there is a variety in the development of the tapetum, megaspore, embryo sac, and endosperm nearly as great as can be found in the whole range of angiosperms. The development of the seed, however, suggests relationships of Piperaceae and Saururaceae to other dicotyledonous families; and the author concludes from such evidence that the Piperales are not very primitive angiosperms, and that they are probably most nearly allied to the four dicotyledonous orders with perisperm-containing seeds—Aristolochiales, Polygonales, Centrospermales, and Ranales.—J. M. C.

MISS RIDDLE[14] has investigated *Batrachium longirostris*, more often regarded as one of the white-flowered species of Ranunculus. So many of the Ranunculaceae have been studied from this point of view that the essential features of the family seem to be well in hand, and in no important respect does the species investigated by Miss RIDDLE change the situation. In the development of the microsporangium there is probably the interesting combination of parietal and sporogenous tissue to form the tapetal layer. It is noteworthy, also, that the male cells, or at least their nuclei, appear just before pollination. In the development of the megasporangium two or more archesporial cells often appear, and no parietal cell is cut off. The antipodals have the character that belongs to the family, retaining the primitive number, but increasing much in size. In the development of the embryo the suspensor is short and somewhat massive, the longitudinal division of the end cell of the proembryo occurring when it consists of three cells.—J. M. C.

SABLON[15] has studied the development of the sporogonium of mosses with the view of comparing it with the development of the stems of vascular plants,

[13] JOHNSON, DUNCAN, S., Seed development in the Piperales and its bearing on the relationship of the order. Johns Hopkins Univ. Circ. No. 178. pp. 28–31. 1905.

[14] RIDDLE, LUMINA C., Development of the embryo sac and embryo of *Batrachium longirostris*. Ohio Nat. **5**: 353–363. *pls. 22–24*. 1905.

[15] SABLON, LECLERC DU, Sur le développement du sporogone des mousses. Rev. Gén. Bot. **17**: 193–197. *figs. 3*. 1905.

carrying forward a point of view suggested in 1878 by KIENITZ-GERLOFF. The sporogonium described is that of *Funaria hygrometrica*, although *Bryum nutans* was also studied. SABLON states that the first periclinal division of the apical segments differentiates a cortical-epidermal region from a central cylinder. The former region continues centrifugal periclinal divisions until the last or so-called epidermal layer is differentiated. This late differentiation of the outermost layer is a feature of the pteridophytes and not of seed-plants. The innermost or oldest layer corresponds to the endodermis of vascular plants. The central cylinder, on the other hand, shows a centripetal succession in its periclinal divisions, the outermost layer, giving rise to sporogenous tissue, being the oldest and corresponding to the pericycle of vascular plants.—J. M. C.

NEWCOMBE[16] has applied three methods to the determination of the angle for maximum response of primary roots and stems. The method of noting the perception time did not give decisive results, although a shorter perception time for a deviation of 90° was indicated than for 135°. The method of noting the after effect did not yield satisfactory results. The method of alternate stimulation at 90° and at 135° deviation from position of stable equilibrium gave very positive results in favor of the former angle. These results discredit the conclusion of CZAPEK that the strongest stimulation occurs at a deviation of 135°. The author's conclusion, recently announced, that orthotropic roots and stems do not receive equal stimulation at equal angles above and below the horizontal, is withdrawn, and support is given to FITTING'S view that equal stimuli are received at equal angles above and below the horizontal.—RAYMOND H. POND.

FIGDOR[17] finds that the sheathing leaf base of grasses, in addition to protecting and supporting the unfolding bud, performs the function of a guiding organ. While the growing apex of the young shoot is still enclosed by the cotyledon, the latter, being sensitive to light and gravitation, assumes a favorable position into which the emerging leaf is directed. Coincident with the protrusion of the leaf the growth of the cotyledon ceases and its sensitiveness to light and gravitation disappears. This guiding function of the cotyledon is then assumed by the sheathing leaf base, as the author finds, by virtue of its sensitiveness to light and gravitation. The blade is not sensitive to light, but the vaginal portions of the sheath are and in such portions the sensibility is uniform. The evidence for regarding the sheath as sensitive to gravitation might be more convincing.—RAYMOND H. POND.

HIGHLY SPECIALIZED plant cells and their peculiarities are discussed by DAVIS[18] in a continuation of his studies upon the plant cell. The forms con-

[16] NEWCOMBE, F. C., Geotropic response at various angles of inclination. Ann. Botany **19**:311–323. 1905.

[17] FIGDOR, W., Ueber Heliotropismus und Geotropismus der Gramineenblätter. Ber. Deutsch. Gesells. **23**:182–191. 1905.

[18] DAVIS, B. M., Studies on the plant cell. III. Section 3. Highly specialized plant cells and their peculiarities. Amer. Naturalist **38**:571–594, 725–760. 1904.

sidered are the zoospore, sperm, egg, spore mother cell, coenocyte, and coenogamete. Sperms and eggs are compared with the zoospores with which they are phylogenetically related. After considering the literature of the blepharoplast, the writer is inclined to the view that it does not represent a centrosome. The statement that the synergid may possibly represent portions of a reduced archegonium is somewhat surprising. The author believes that there is no qualitative reduction during the mitoses in the spore mother cell. Pallavicinia receives particular attention. About one hundred and twenty papers are cited in the bibliography of this section.—C. J. CHAMBERLAIN.

SHREVE[19] has investigated the morphology of *Sarracenia purpurea*. The microsporangium passes the winter in the mother cell stage, a two-layered tapetum is developed, the reduced number of chromosomes is twelve, and the tube and generative nuclei appear before the shedding of the pollen. In the megasporangium the integument is single, no parietal cell is cut off, and a linear series of four spores usually appears, although there are variations in number and arrangement. The functional megaspore (innermost one) destroys the overlying nucellar layer at the micropylar end and comes to lie directly against the integument. The endosperm has developed extensively when the embryo is two-celled. In germination the cotyledons act as haustoria, "and survive as simple liguliform leaves bearing chlorophyll."—J. M. C.

FRITSCH[20] claims that the cells of the Cyanophyceae are provided with a delicate cell immediately investing the protoplast in addition to the sheath, which is characteristic of many forms or of mucilaginous envelops. The inner investment is regarded as a modified plasma membrane of a viscous gelatinous nature. The outer envelop is called the cell-sheath, and is believed to be a modified innermost layer of the external mucilaginous investment. This view is quite different from that of most algologists, who regard the sheath as directly derived from the protoplast. FRITSCH also believes that the intercellular protoplasmic connections described by other authors are due to peculiarities in the staining of the gelatinous partitions between the cells.—B. M. DAVIS.

THE LAMINARIACEAE pass through several phases in their life histories, which have been grouped as the embryonal and the post-embryonal. The embryonal stages include the periods up to the time when the simple laminarioid frond is developed; and the post-embryonal the later changes leading to the adult condition which is so various in the different genera. Considerable attention is likely to be given to the post-embryonal stages of development, which promise to throw much light on the problems of relationship. YENDO'S work in 1902–3 on Echlonia, Eisenia, and Hedophyllum has recently been supplemented by an

[19] SHREVE, FORREST, The development of *Sarracenia purpurea* L. Johns Hopkins Univ. Circ. No. 178. pp. 31–34. 1905.

[20] FRITSCH, K., Studies on the Cyanophyceae. II. Structure of the investment and spore-development in some Cyanophyceae. Beih. Bot. Centralbl. **18**: 194–214. *pl. 1.* 1905.

investigation of SETCHELL[21] on the last two genera and Thalassiophyllum.—B. M. DAVIS.

GWYNNE-VAUGHAN[22] has had the opportunity to study the anatomy of the Chinese marattiaceous genus Archangiopteris, established in 1899 by CHRIST and GIESENHAGEN. Only a single small specimen was available, but if it represents the structure of the larger stems, the genus has a simpler anatomical structure than any of the other Marattiaceae. The single internal vascular strand characteristic of young plants of Angiopteris, Marattia, and Danaea, persists in the mature stem of Archangiopteris. The sporangia were examined by Professor BOWER and reported as corresponding very closely in structure to those of Angiopteris.—J. M. C.

IN AN INVESTIGATION of the fluctuations in the number of ray-flowers of *Chrysanthemum segetum*, LUDWIG[23] has attempted to answer the question how large a number of heads must be counted to insure trustworthy determination of the modes. By counting in lots of fifty heads and adding the results, he comes to the conclusion that in this species 500 heads may be considered the lower limit; that in most species 1000 counts are necessary; and in some 10,000 or even 20,000. He deprecates the work done by American and English investigators who have contented themselves with biometric analysis of a couple hundred observations.—G. H. SHULL.

SETCHELL[24] gives a brief account of several parasitic red algae found on the coast of California and describes a new genus, *Peyssonneliopsis epiphytica* Setchell and Lawson, "growing in small dark red pustules scattered over the surface of membranaceous Rhodophyceae, sending rhizoidal filaments deep into the tissue of the host plant; antheridia and cystocarps unknown." The form is said to differ from Cruoria "only in its parasitic habit and consequent possession of rhizoidal filaments penetrating the host plant." It may perhaps be questioned whether such characters alone justify the establishment of a new genus.—B. M. DAVIS.

WHITE[25] has narrated again for the benefit of the general public his interesting experiences with tomatoes. He describes two separate instances in which seed from the Acme variety of *Lycopersicum esculentum* produced only plants of the potato-leaved tomato, which he calls *L. solanopsis*, and the latter then bred

[21] SETCHELL, W. A., Post-embryonal stages of the Laminariaceae. Univ. Calif Pub. Botany **2**:115–138. *pls. 3.* 1905.

[22] GWYNNE-VAUGHAN, D. T., On the anatomy of *Archangiopteris Henryi* and other Marattiaceae. Ann. Botany **19**:259–271. *pl. 10.* 1905.

[23] LUDWIG, F., Zur Biometrie von *Chrysanthemum segetum*. Festschr. zu Ascherson's 70 stem Geburtstag. pp. 296–301. 1904.

[24] SETCHELL, W. A., Parasitic Florideae of California. Nuova Notarisia. **16**: 59–63. 1905.

[25] WHITE, C. A., The mutations of Lycopersicum. Pop. Sci. Monthly **67**:151–161. *figs. 2.* 1905.

true to its new characters. The author gives repeated assurance that the care taken with these plants leaves no possibility of error. He does not consider the theoretical possibility that his plants were the "extracted recessives" in second-generation Mendelian hybrids instead of mutations.—G. H. SHULL.

STEINER[26] has found intumescences on the leaves of *Ruellia formosa* and *Aphelandra Porteana*, and traced their development. Excessive humidity is found to be the determining condition, as is already known in the case of several other plants. Submersion and darkness each inhibit the appearance of such swellings, while wounding or poisoning cannot be used to induce their formation. The author has evidently overlooked ATKINSON'S work of several years ago, in which excessive humidity was found to be important in causing oedema of tomato. —RAYMOND H. POND.

BARBER[27] has given an account of the haustoria of the roots of *Santalum album*. It seems that those in charge of sandal plantations were for a long time uncertain as to the parasitic nature of this tree. There is a certain amount of selection as to hosts, certain plants being much more efficient "nurses" than others. The haustorium arises independently of the presence of any foreign rootlets. When there is contact with such a rootlet the haustorium applies itself closely to its surface, enlarges, and assumes a "conical or bell-like form."—J. M. C.

MISS BERRIDGE[28] has discovered and studied two new specimens of the Carboniferous strobilus described by SCOTT as *Spencerites insignis*, of which only four specimens were known. In consequence, the original diagnosis is considerably modified, but the relationship to other paleozoic Lycopods as outlined by SCOTT remains unaffected.—J. M. C.

THE FISHER FOLK of the Hawaiian Islands apply the term "limu" to the seaweeds of their coasts. They make use of a large number of forms as food and garnishes with fish, shrimps, and limpets. SETCHELL[29] gives a lengthy list of the native names, identifying them in many cases with particular species.—B. M. DAVIS.

LEAVITT and SPALDING[30] have announced their determination of parthenogenesis in *Antennaria fallax* and *A. neodioica*, and the great probability of its occurrence in *A. canadensis* and *A. Parlinii*. A detailed account, with drawings, will be published later.—J. M. C.

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[26] STEINER, R., Ueber Intumeszenzen bei *Ruellia formosa* Andrews und *Aphelandra Porteana* Morel. Ber. Deutsch. Bot. Gesells. **23**:105–112. *pl. 2.* 1905.

[27] BARBER, C. A., The haustoria of sandal roots. Indian Forester **31**:189–201. *pls. 14–19.* 1905.

[28] BERRIDGE, MISS E. M., On two new specimens of *Spencerites insignis*. Ann. Botany **19**:273–279. *pls. 11–12.* 1905.

[29] SETCHELL, W. A., "Limu." Univ. Cali. Pub. Botany **2**:91–113. 1905.

[30] LEAVITT, R. G., and SPALDING, L. J., Parthenogenesis in Antennaria. Rhodora **7**:105. 1905.